

Certificate

Produced in double accredited
laboratory fulfilling
ISO/IEC 17025 and
ISO Guide 34

This certificate is designed in accordance with ISO Guide 31 ^[1].

Substance: **L-Glutamic acid**

Product no.: **95436**

Lot no.: **BCBB4432**

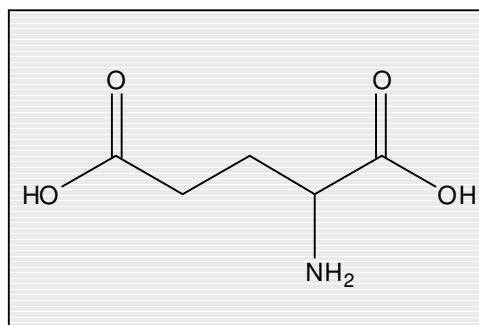
Formula: **C₅H₉NO₄**

Molecular mass: **147.13**

Traceability ^[2]: **NIST SRM 84k**
Potassium hydrogen phthalate

Certificate issue date: **June 29, 2010**

Expiry: **Jun/2012**



Certified value and uncertainty according to ISO Guide 35 ^[3] and Eurachem/CITAC Guide ^[4]		
Substance	Certified value (non-stereo specific)	Expanded uncertainty, $U = k \cdot u_c$ ($k = 2$)
Glutamic acid	99.7 % (g/g)	0.1 % (g/g)

Minimum sample: 160 mg is recommended as the minimal sample amount. If less material is used, it is recommended to increase the certified uncertainty by a factor of two for half of sample and a factor of four for one fourth mg of sample.

Drying instruction: This material does not require drying before use.

Intended use: Use this CRM as calibrant for chromatography or any other analytical technique.

Storage and handling: The CRM should be stored in the original bottle at room-temperature (20-25°C). After use the bottle should be tightly closed and protected from excessive moisture and light.

CRM operations:

A. Rück

A. Rück, Ph.D.

Certification body:

Klaus-D. Schmidt

K.-D. Schmidt, Ph.D.



SRMS 001
ISO Guide 34



STS 490
ISO/IEC 17025



16368-02
ISO 9001

UNCERTAINTY CALCULATION

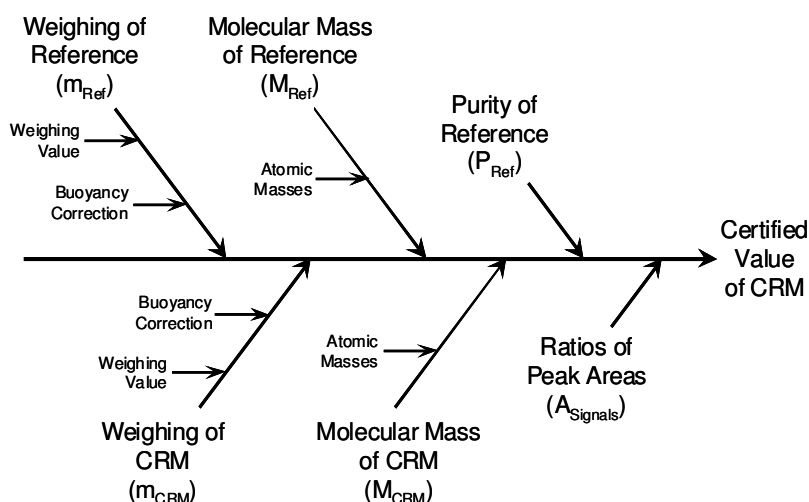
All uncertainties are calculated according to Eurachem/CITAC Guide and reported as combined expanded uncertainties. The uncertainty contributions are illustrated by the following cause-effect diagram.

Typical relative contributions are:

$u(P_{\text{Ref}})$	< 0.05 %
$u(m_{\text{Ref}})$	< 0.03 %
$u(m_{\text{CRM}})$	< 0.03 %
$u(M_{\text{Ref}})$	< 0.003 %
$u(M_{\text{CRM}})$	< 0.003 %
$u(A_{\text{Signals}})$	0.05-0.15 %

The combined uncertainty is calculated by combination of the squared contribution values.

Expanded uncertainty is then calculated to a confidence level of 95%, typically by multiplying with a confidence level factor of $k=2$.



EXTENDED ANALYTICAL DATA

Optical activity	$[\alpha]_{\text{D}}^{20} = +31.5 \pm 1.0^\circ$, $c = 5 \%$ in 5 M HCl
Total impurities	insoluble matter, passes filter test
Ign. residue	$\leq 0.05 \%$ (as SO_4)
Loss	$\leq 0.05 \%$ loss on drying, 20 °C (HV)
mp	205 °C (dec.) (lit.)
Solubility	1 M HCl: soluble 1 M at 20 °C, clear, colorless

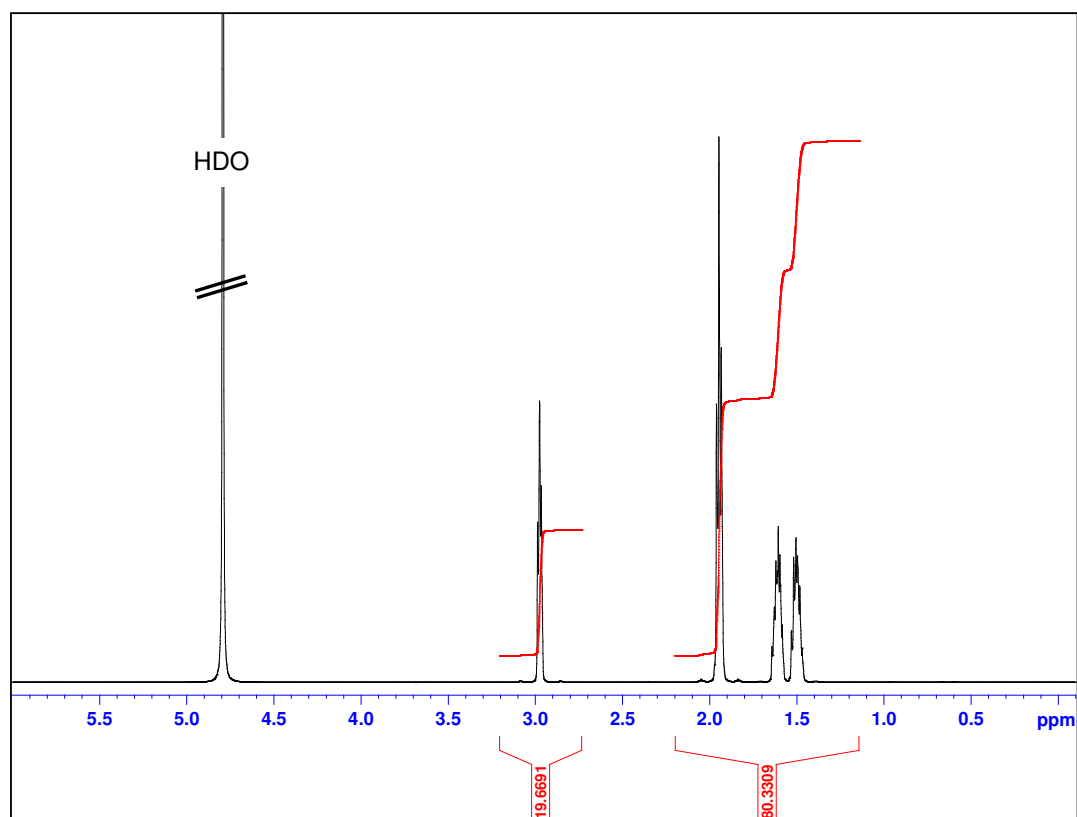
Anion traces	chloride (Cl^-): $\leq 100 \text{ mg/kg}$ sulfate (SO_4^{2-}): $\leq 200 \text{ mg/kg}$
---------------------	--

Cation traces	Al: $\leq 5 \text{ mg/kg}$	Li: $\leq 5 \text{ mg/kg}$
	Ba: $\leq 5 \text{ mg/kg}$	Mg: $\leq 5 \text{ mg/kg}$
	Bi: $\leq 5 \text{ mg/kg}$	Mn: $\leq 5 \text{ mg/kg}$
	Ca: $\leq 200 \text{ mg/kg}$	Mo: $\leq 5 \text{ mg/kg}$
	Cd: $\leq 5 \text{ mg/kg}$	NH_4^+ : $\leq 100 \text{ mg/kg}$
	Co: $\leq 5 \text{ mg/kg}$	Na: $\leq 200 \text{ mg/kg}$
	Cr: $\leq 5 \text{ mg/kg}$	Ni: $\leq 5 \text{ mg/kg}$
	Cu: $\leq 5 \text{ mg/kg}$	Pb: $\leq 5 \text{ mg/kg}$
	Fe: $\leq 5 \text{ mg/kg}$	Sr: $\leq 5 \text{ mg/kg}$
	K: $\leq 50 \text{ mg/kg}$	Zn: $\leq 5 \text{ mg/kg}$

UV absorption	($c=1 \text{ M}$ in 1 M HCl)
	$\lambda: 260 \text{ nm}$ $A_{\text{max}}: 0.1$
	$\lambda: 280 \text{ nm}$ $A_{\text{max}}: 0.1$

EXTENDED ANALYTICAL DATA (CONT.)

¹H-NMR Spectrum (600 MHz, Glutamic acid in D₂O/NaOD)



REFERENCES

- [1] ISO Guide 31, 2nd Ed. (2000), "Reference materials - Contents of certificates and labels"
- [2] Eurachem/CITAC Guide, 1st Ed. (2003), "Traceability in chemical measurement"
- [3] ISO Guide 35, 3rd Ed. (2006), "Reference materials - General and statistical principles for certification"
- [4] Eurachem/CITAC Guide, 2nd Ed. (2000), "Quantifying uncertainty in analytical measurement"
- [5] ISO/IEC 17025, 2nd Ed. (2005), "General requirements for the competence of testing and calibration laboratories"
- [6] ISO Guide 34, 3rd Ed. (2009), "General requirements for the competence of reference material producers"